Effects of pretreatments of Napier Grass with deionized water, sulfuric acid and sodium hydroxide on pyrolysis oil characteristics

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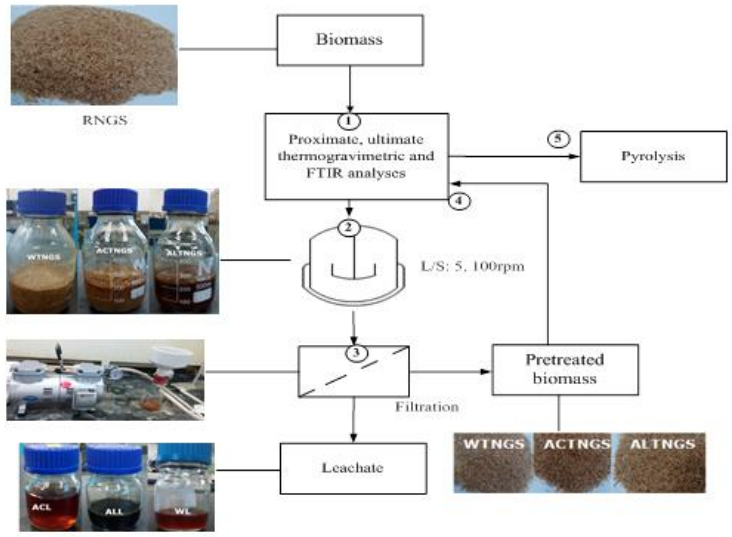

Biomass
RNGS
1
Proximate, ultimate thermogravimetric and FTIR analyses
5
Pyrolysis
4
2
WTNGS
ACTNGS
ALTNGS
L/S: 5, 100rpm
3
Filtration
Pretreated biomass
WTNGS
ACTNGS
ALTNGS
Leachate
ACL
ALL
WL

Field Code Changed

Raw biomass

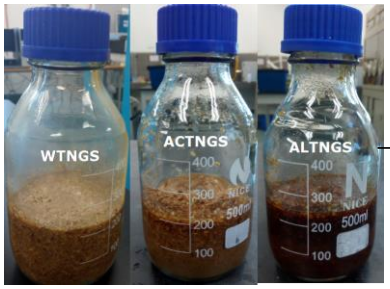
1

Proximate, ultimate thermogravimetric and FTIR analyses

5

Pyrolysis

4



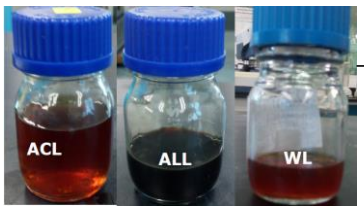
2

Liquid/solid ratio: 5
Agitation speed: 100 rpm

3

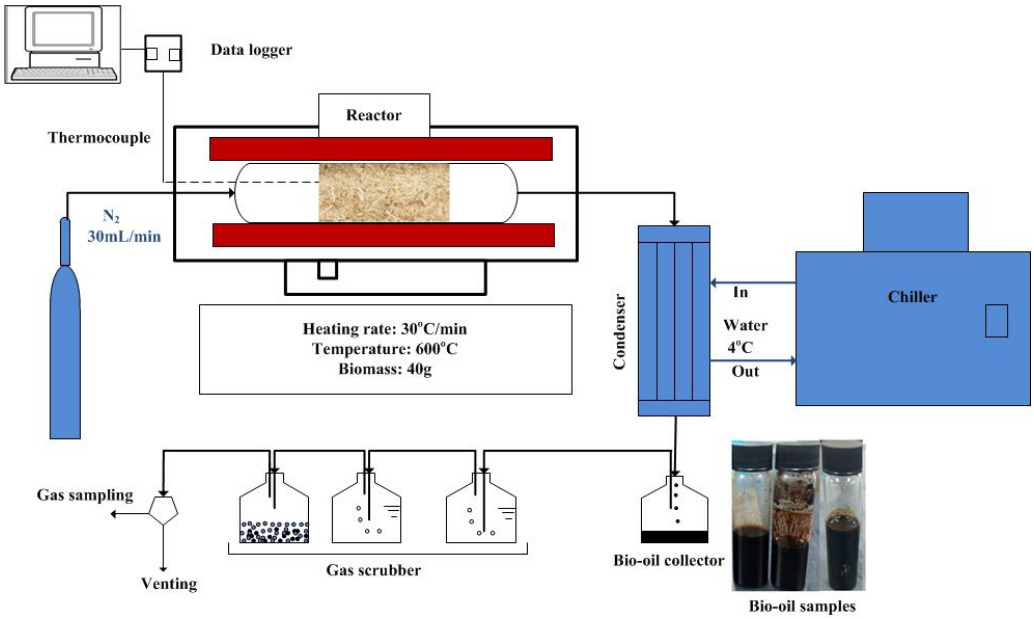
Filtration

Pretreated biomass



Leachate

Figure 1: Pretreatment process flow diagram. (RNGS) raw NGS, (WTNGS) water treated NGS, (ACTNGS) acid treated NGS, (ALTNGS) alkaline treated NGS, (WL) water leachate, (ACL) acid leachate and (ALL) alkaline leachate.



~~**Figure 2.** Pyrolysis system with a fixed bed reactor~~

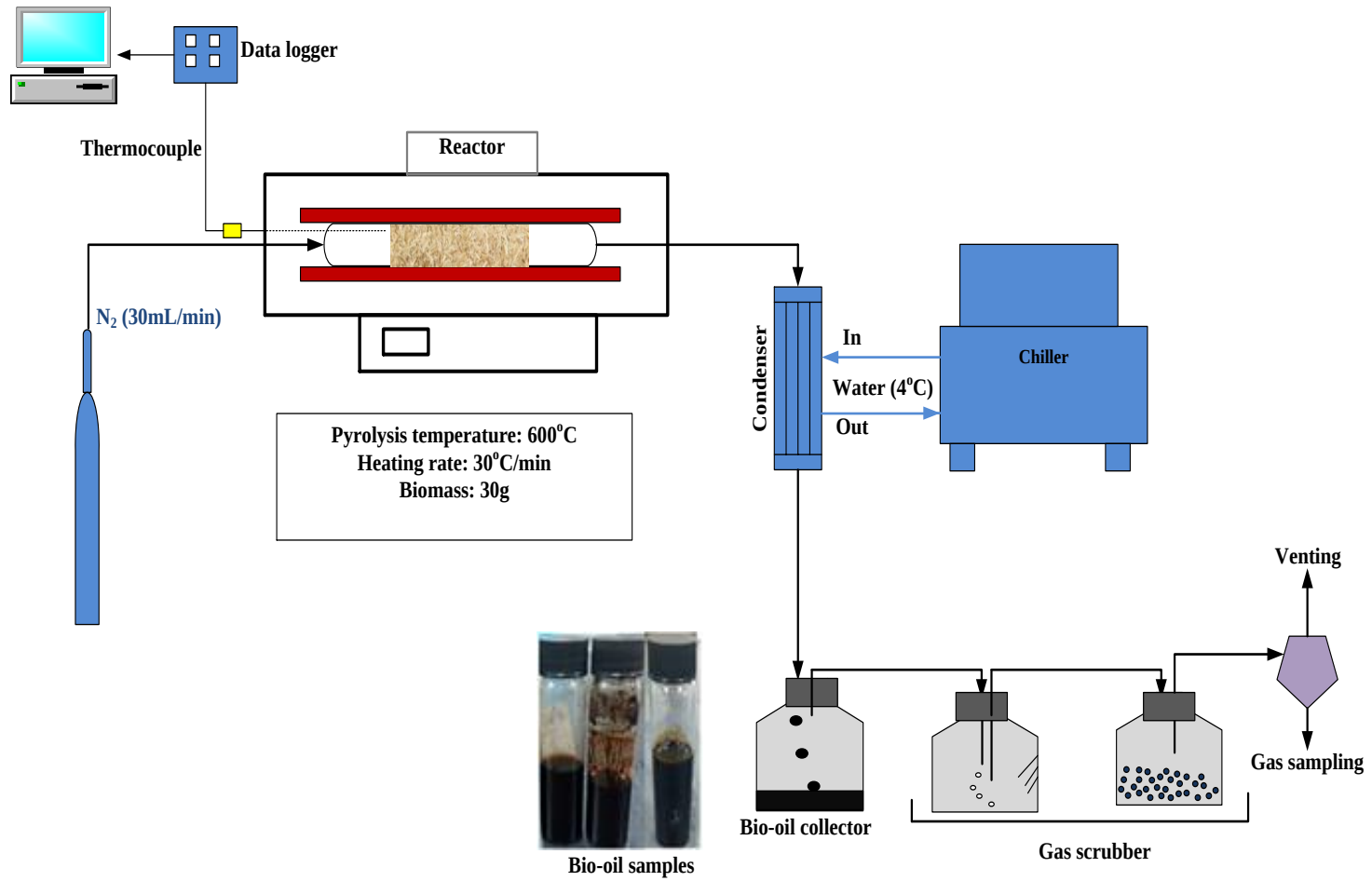


Figure 2. Pyrolysis system with a fixed bed reactor

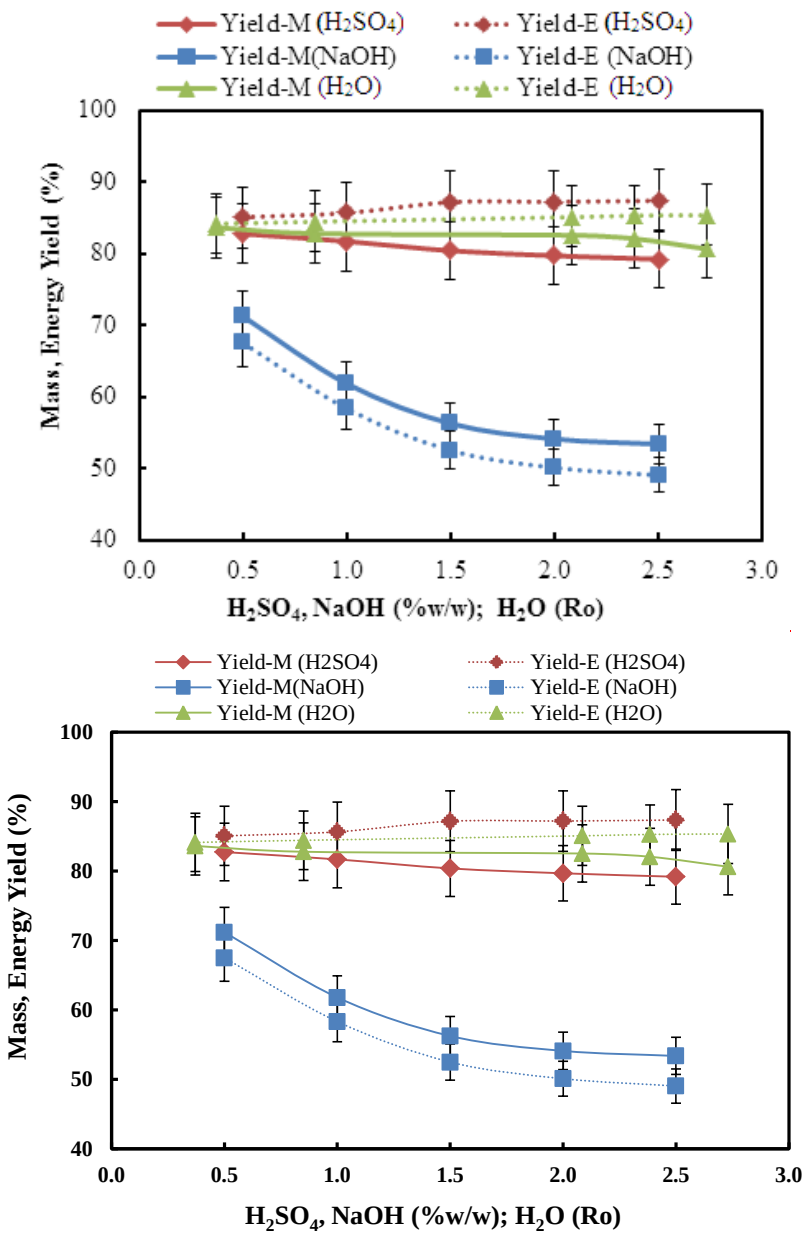


Figure 3. Mass and energy yield of pretreated samples. (YM) mass yield and (YE) energy yield

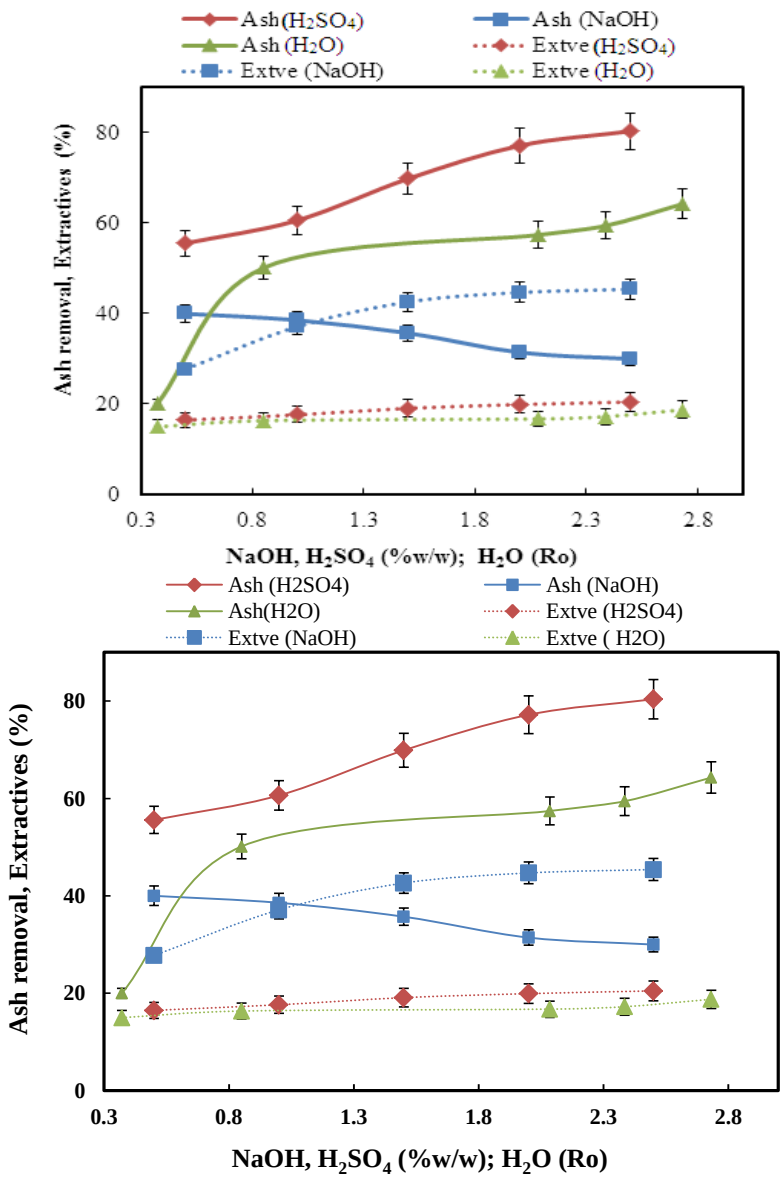


Figure 4. Effect of pretreatment solvents on ash removal and extractives from NGS.

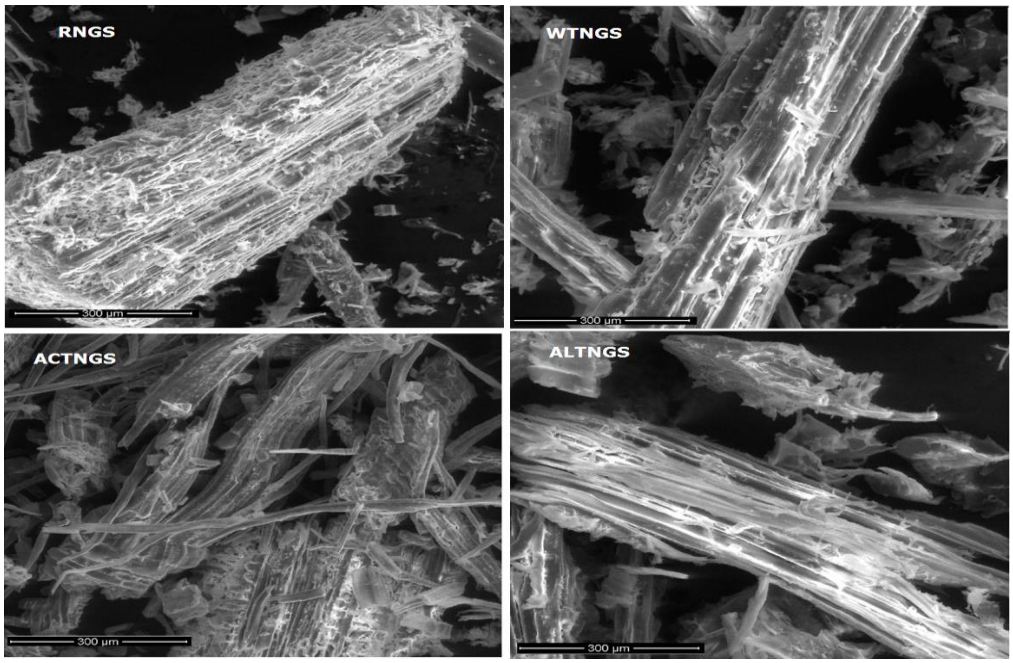
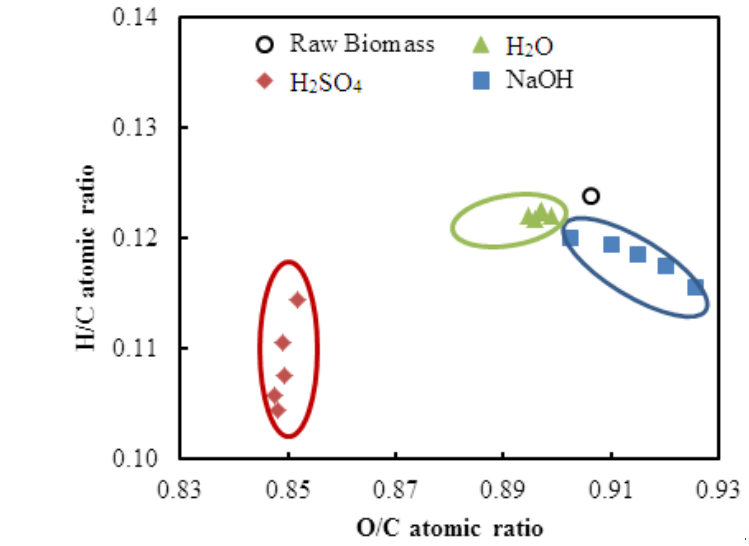


Figure 5. SEM images of raw and pretreated samples. Scanning conditions: HV (20kV), Mag (1200x). (RNGS) raw NGS, (WTNGS) water treated-Ro: 0.9, (ACTNGS) acid treated-1.5 w/w% H2SO4 and (ALTNGS) alkaline treated 1.5 w/w% NaOH



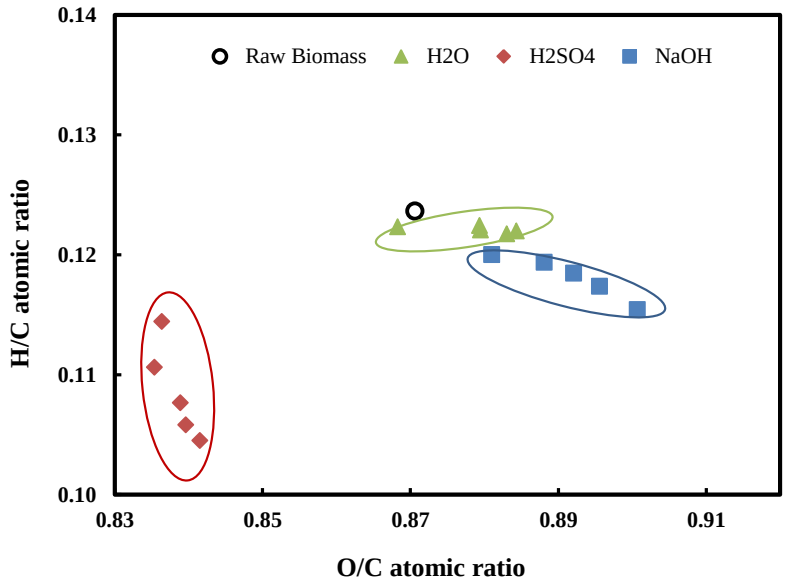


Figure 6. Van Krevelen plot raw and pretreated samples

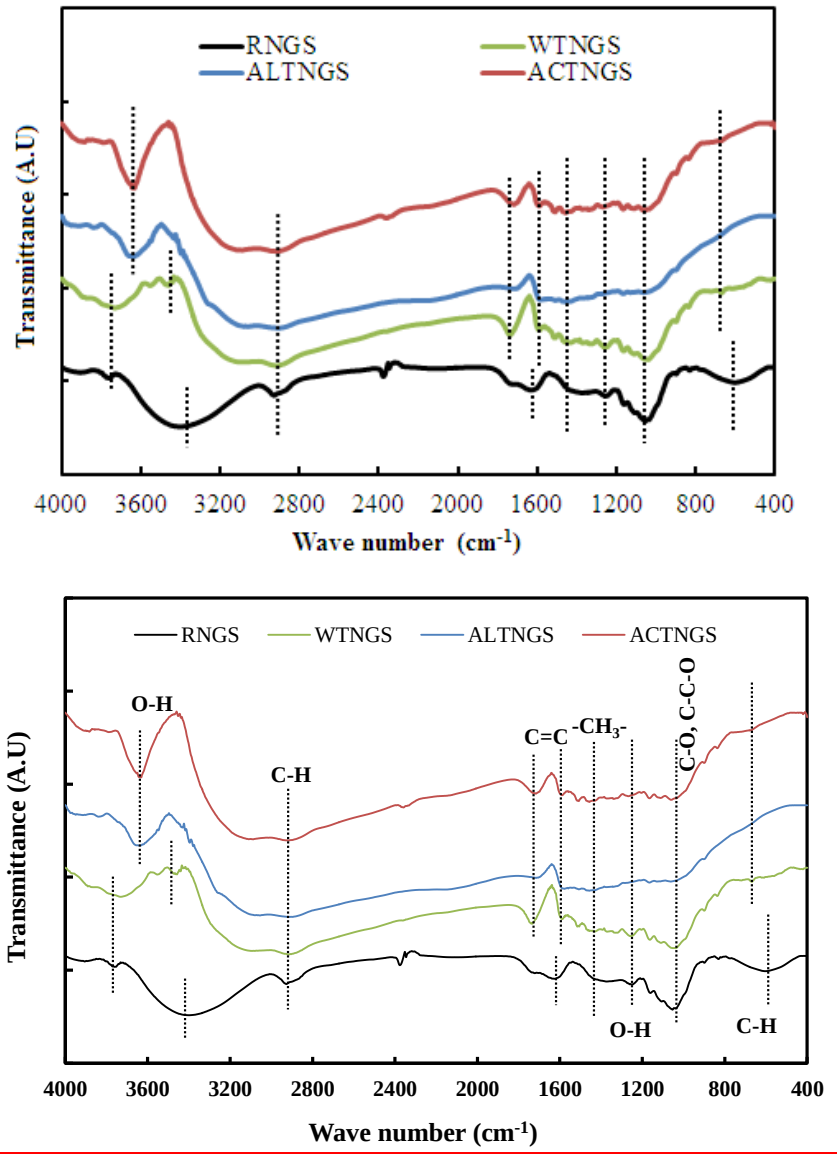


Figure 7. Averaged FTIR spectra (auto-smoothed and auto-baseline corrected) of Napier grass samples (RNGS, WTNG-0.9, ALTNGS-1.5% and ACTNGS-1.5%)

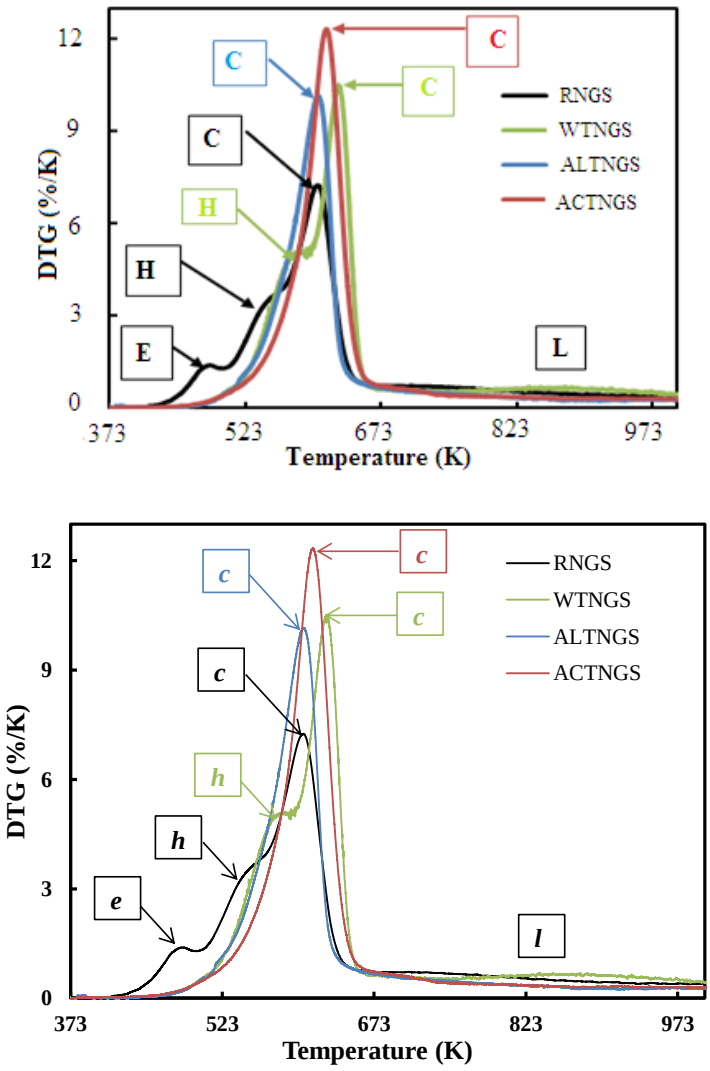


Figure 8. DTG of RNGS, ACTNGS and ALTNGS on dry basis. (*e*) Extractives; (*h*) Hemicellulose; (*c*) Cellulose; and (*l*) lignin decompositions. Condition: nitrogen atmosphere (20 mL/min), heating rate (10 K/min).

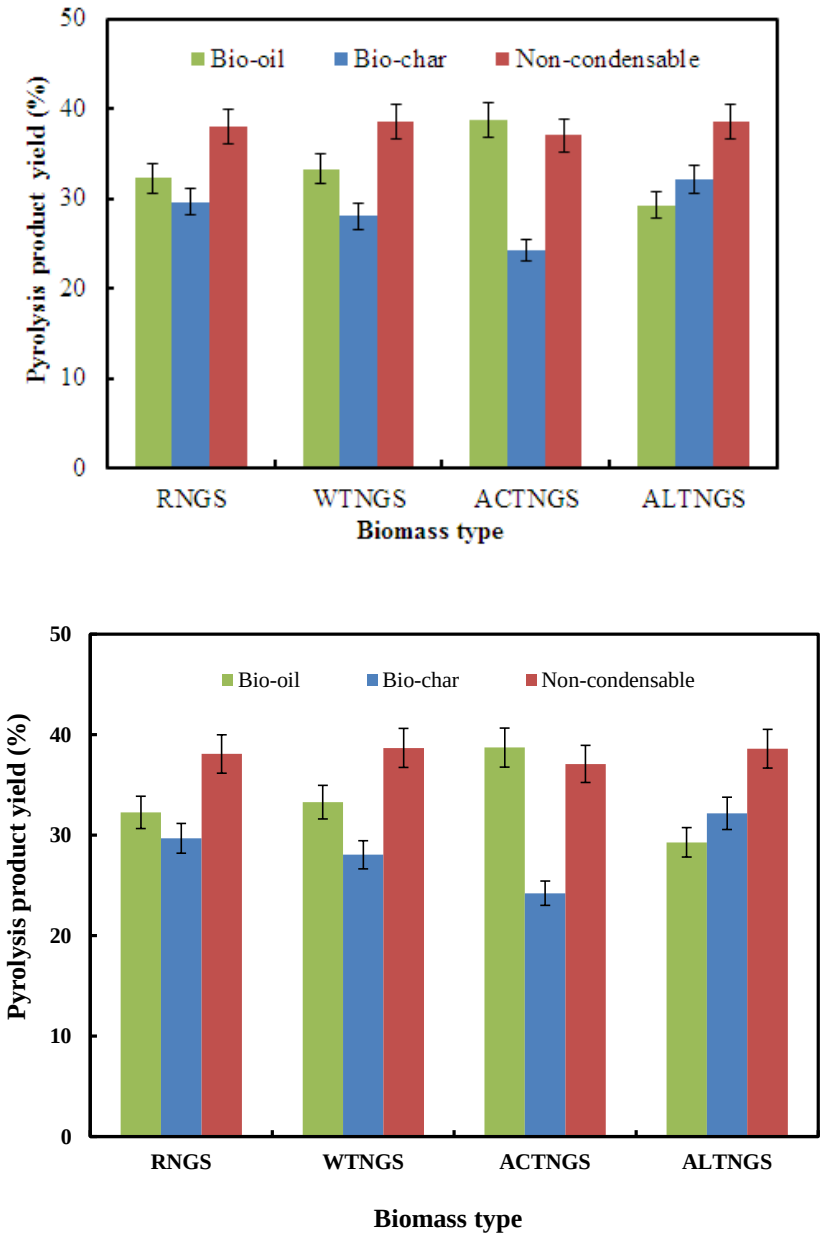


Figure 9. Pyrolysis products distribution from the raw and pretreated Napier grass samples. Biomass condition: bone dry, 0.2 to 2 mm particle size; heating rate: 30 °C/min, nitrogen flow rate: 30 mL/min; pyrolysis temperature: 600°C

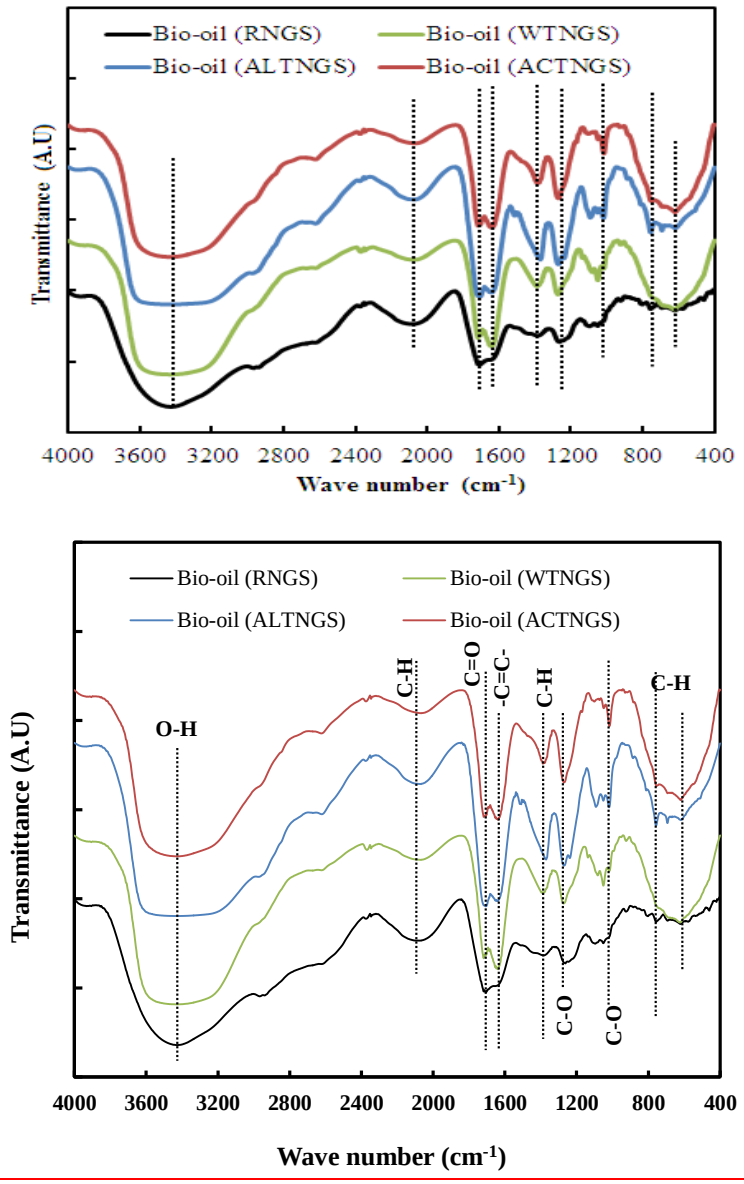


Figure 10. Averaged FTIR spectra (auto-smoothed and auto-baseline corrected) of bio-oil from raw and pretreated samples

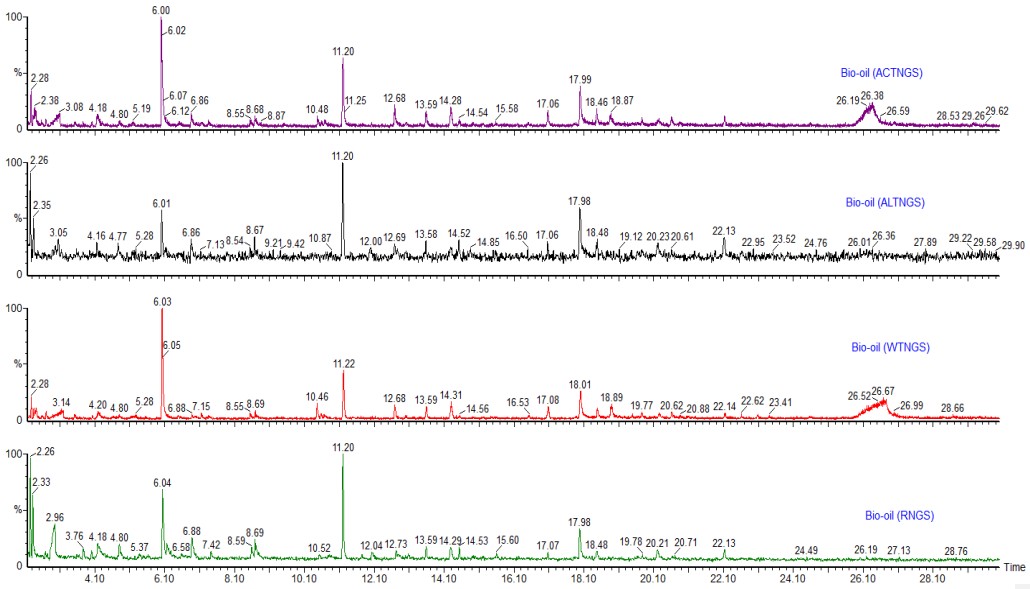


Figure 11. GC-MS chromatogram of bio-oil samples from raw and pretreated Napier grass

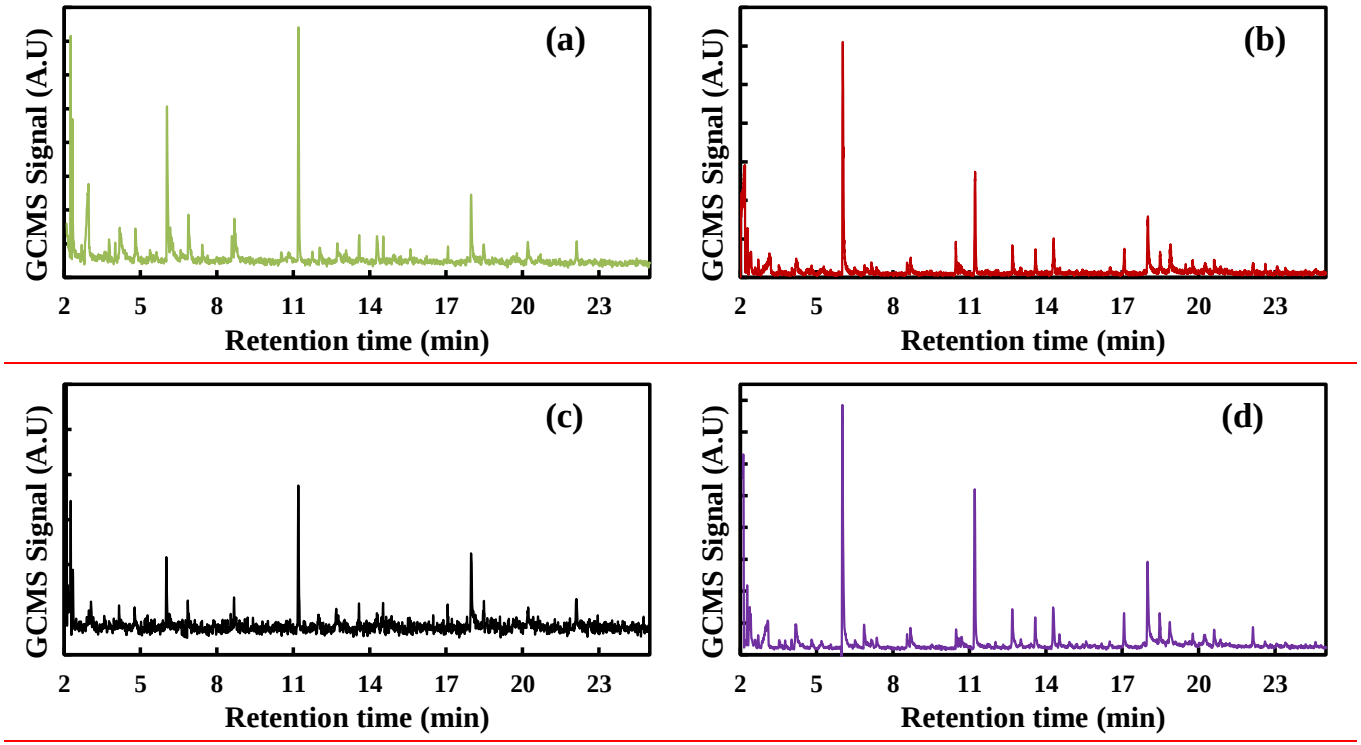


Figure 11. GC-MS chromatogram of bio-oil samples Napier grass. (a) RNGS, (b) WTNGS, (c) ALTNGS, (d) ACTNGS

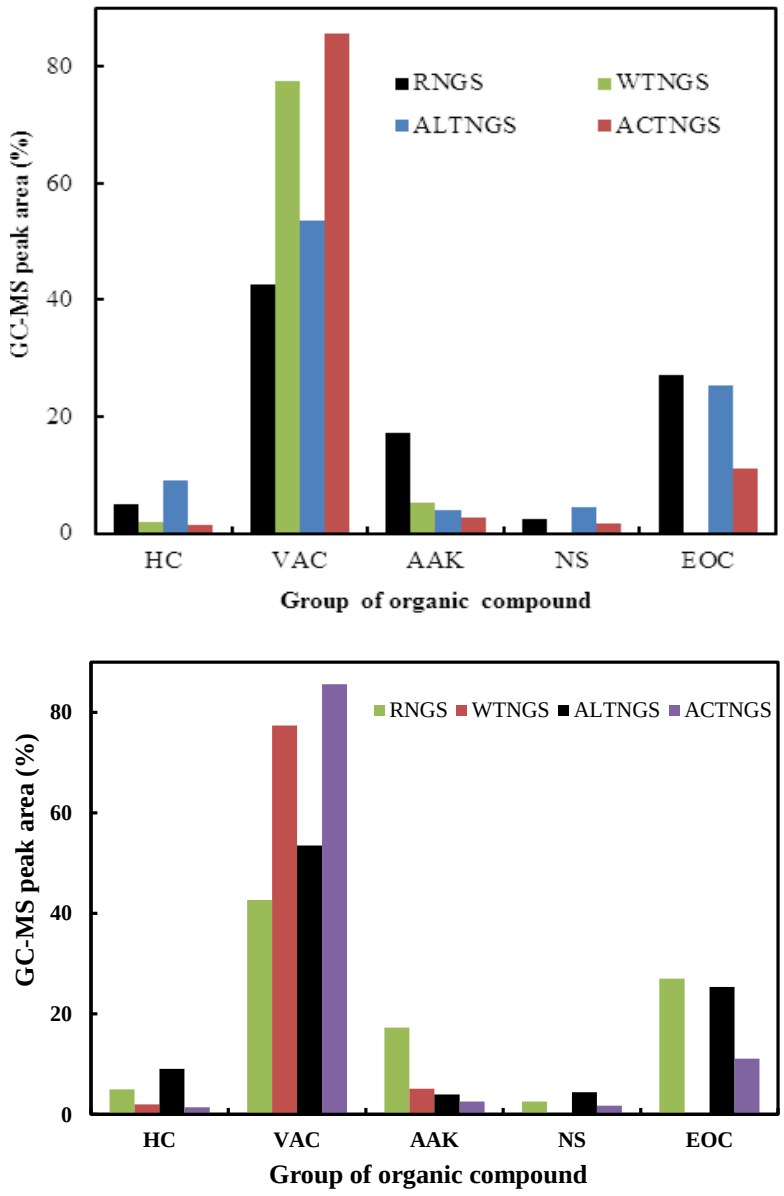


Figure 12. Classification of organic in the bio-oil from raw and pretreated NGS samples